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for

AEROSOL SOLVENT WELD CEMENT, DISPENSING SYSTEM AND METHOD OF JOINING PLASTIC PIPE

Inventor: Ronald D. Green

Attorneys: Standley & Gilcrest
Attn.: Roger A. Gilcrest
495 Metro Place South, Suite 210
Dublin, Ohio 43017-5315
Telephone: (614) 792-5555
Facsimile: (614) 792-5536

AEROSOL SOLVENT WELD CEMENT, DISPENSING SYSTEM AND METHOD OF JOINING PLASTIC PIPE

Inventor: Ronald D. Green

Background Of The Invention

The present invention is directed to an aerosol Solvent Weld Cement ("SWC"), a dispensing system and a method of joining plastic pipe.

Plastic pipe has become increasing used in a wide variety of applications, such as in water transmission networks, residential plumbing, and even in the construction of a wide variety of structures bearing no relation to water transmission.

Plastic pipe continues to replace ceramic and metal pipe in a variety of applications owing to its reduced weight, lower cost, and resistance to cracking under stress.

Plastic pipe, such as PVC pipe, has the advantage of being capable of forming water tight junctions through the use of SWCs, while ceramic pipe relies primarily on interference fittings and metal pipe on welded joints. The use of SWCs allows the plastic pipe to be joined by relatively unskilled workers as compared to the use of welding or soldering equipment in metal pipes.

However, in the laying of such water pipe underground, pipe sections are joined through the use of SWCs. For example, within the confines of a 7 to 10 foot (2 to 3 meter) deep trench box, however, the conditions are far from ideal. Application of SWCs typically has involve application of liquid SWCs which are messy. Moreover, in such applications, the pipe installer has no convenient location where the open SWC container can be placed. The SWC container typically is placed alongside the top of the trench. The SWC container may be knocked or kicked over, resulting in loss of SWC, contamination of the soil with hazardous substances, and attendant loss of time and productivity. The SWC may also be contaminated, typically by dirt, debris or water at the work site, which can adversely affect the efficacy of the SWC.

Liquid solvent weld cement (SWC) ~~are~~ is typically applied by use of a brush, and therefore do not provide the optimum uniformity of application. Liquid SWC often ~~do~~ does not provide an optimally even coating of an effective amount of SWC, and sometimes cause waste and attendant mess through liquid run-off.

Also, liquid SWC typically does not allow the installer enough time to properly align the plastic pipe pieces because the cement sets up in only a few seconds, and produces a bond that cannot be altered. Accordingly, it is desirable to be able to apply SWC to plastic pipe in such a way that set-up time is extended to better allow the installer enough time to properly align the plastic pipe pieces, and be assured that the joint is properly completed.

In view of the foregoing it will be appreciated that there has existed and remains a need for improvements in the known methods for solvent welding pipe. Such improvements, if proving fast, safe, and reliable, would be well-received by contractors and workers alike, and would represent an important advancement to the construction industries.

Some of the practical advantages provided by the present invention include providing a neat and reliable SWC that can provide uniform application to the desired surface, and which resists contamination and oxidation.

Another advantage of the present invention includes providing a method of applying SWC for joining plastic pipe that allows the installer to quickly apply an effective amount of the SWC, while be afforded enough set-up time to properly align and complete the joint between two plastic pipe pieces. Still another benefit of the present invention is that it allows the installer to apply SWC for joining plastic pipe using only one hand instead of the two-hand method of using a can and brush dispenser.

In view of the present disclosure or through practice of the present invention, other advantages and the solution to other problems may become apparent.

Summary of the Invention

The present invention includes an aerosol SWC composition for adhering plastic pipe, and a method of using same.

The aerosol SWC composition and the method of use may be applied to weld a variety of plastic pipe in a wide array of applications. For instance, the present invention can be applied in interior and exterior plumbing (both commericial and residential), in water supply, communication pipe, drainage, waste ventilation and underground water and waste water systems, as well as for irrigation or any other water conduit.

In general, the aerosol SWC composition of the present invention comprises: (a) at least one resin adapted to bond to the plastic pipe; (b) at least one solvent; and (c) at least one

propellant; wherein the composition is under a pressure greater than ambient atmospheric pressure.

The resin SWC's may be any resin or combination appropriate for welding the plastic of the pipe selected, and may be selected from the group consisting of chloropolyvinylchloride resins, polyvinylchloride resins, ABS resins and butyrate and acrylic resins. It is preferred that the resin content of the aerosol SWC composition be in the range of about 10% - 30% by weight of the aerosol SWC composition. For welding PVC pipe, it is preferred that the resin is a chloropolyvinylchloride resin, and that it be present in an amount of about 10% by weight of the aerosol SWC composition.

The solvent may be any appropriate solvent used in conjunction with the selected resin ~~diethoxyethane~~, including those selected form the group consisting of tetrahydrofuran, acetone, diethoxyethane, N-methyl ~~pyrroidone~~ pyrrolidone, dibasic esters, alkylene carbonates, dimethyl formamide, ethylacetate, methylisobutyl ketone, methyl alcohol, cyclohexanone, and methylethylketone and mixtures thereof. Typically, the solvent(s) will be present in an amount in the range of from about 50% to about 80% by weight of the aerosol SWC composition. For application to PVC, it is preferred that the solvent be a mixture of about 40% by weight tetrahydrofuran, about 15% by weight acetone, about 10% by weight cyclohexanone, and about 5% by weight methylethylketone.

It is preferred that the aerosol SWC composition also contain a suspending agent which may be any of those known in the art, such as amorphous silica. The aerosol thus may be homogeneous or heterogeneous.

The propellant may be any appropriate propellant used in conjunction with the selected resin, and may be selected from the group consisting of dimethyl ether, isobutane, butane, propane, nitrogen, carbon dioxide, 1-difluoroethane, tetrafluoroethane and mixtures of any two or more of said propellants. In the case of PVC, it is preferred that the propellant be dimethyl ether, and that the dimethyl ether be present in an amount of between about 20 % by weight to about 35% by weight of the aerosol SWC composition, and most preferably about 30% by weight of the aerosol SWC composition.

The aerosol SWC composition of the present may be formulated and packaged in accordance with methods and steps known in the art.

The present invention also includes an aerosol SWC composition, as described herein in its many embodiments, in a container for welding plastic pipe. The composition is disposed in

a container adapted to contain the pressurized aerosol SWC composition, and the container comprises an outlet and a valve to control the release of the pressurized aerosol SWC composition from the container. The container may be of any size and may be selected from any type adapted to contain the aerosol SWC composition under pressure. Such containers may include aerosol canisters of the type known in the art, but not limited to, such as those made of tin-plated, unlined tin plated steel or aluminum.

The container preferably should have a 360 degree valve and ~~that it~~ be provided with an unrestricted actuator.

The present invention also includes a method of dispensing an aerosol SWC composition using an aerosol container, as described herein. In broadest terms, the method comprises the steps of (a) obtaining a pressurized aerosol SWC composition of the present invention in a dispensing container, the composition being under a pressure greater than ambient atmospheric pressure; and (b) opening the valve of the container so as to cause the pressurized aerosol SWC composition to be released from said container.

The present invention also includes a method of welding two sections of plastic pipe at a junction by use of an aerosol SWC composition, said method comprising: (a) obtaining a pressurized aerosol SWC composition in accordance with the present invention in a dispensing container, said composition being under a pressure greater than ambient atmospheric pressure; said composition disposed in a container adapted to contain said pressurized aerosol SWC composition, said container comprising an outlet and a valve to control the release of said pressurized aerosol SWC from said container; and (b) opening the valve so as to cause said pressurized aerosol SWC composition to be released from said container onto one or both of the two sections of pipe at the prospective location of the junction; and (c) adjoining the two sections of plastic pipe so as to form the junction by welding action.

The present invention also includes a system for enabling an installer to join two sections of plastic pipe at a junction, which comprises: (a) a pressurized aerosol SWC composition in a dispensing container, as described above; and (b) a holster adapted to be worn by an installer, said holster capable of carrying said dispensing container and adapted so that the dispensing container can be removed by the installer for use and placed back into the holster.

Advantages of the present invention include the convenience of using a closed container in a field trench or other areas that are dirty and wet, which minimizes spillage and

contamination of the SWC. Another advantage is the convenience of spraying the SWC onto the pipe surfaces to be joined. A further advantage is the ability to be able to hold the container at any angle and still have the SWC spray from the container.

Still another advantage is that it has been found that sprayed aerosol SWC provide longer set-up times for the installer. In this regard, it has been found that the freshly sprayed SWC sets up in about 8 to 12 seconds in comparison to the 3 to 5 second set-up time typically experienced in brushed liquid applications. Although not limited to its theory, it is believed that the propellant evaporating from the freshly sprayed adhesive lowers the temperature on the surfaces to be bonded thereby extending the working time. The sprayed SWC also provides an even coating of an effective amount of SWC, eliminating much of the waste and mess associated with liquid applications.

The aerosol spray generally is less cumbersome and is lighter than the can and brush dispensers of the prior art.

Yet another advantage is a holster which carries the container and from, and into which, the container can be placed by the installer while in the trench. Thus, the container is always with the installer, yet the container does not impede the installers ability to work. Yet another advantage is the ability to readily weld pipes in a trench in the field, by being able to quickly applied an effective amount of an SWC to the desired joint area.

The invention, accordingly, comprises the composition, container, system and method possessing the construction, combination of elements, and arrangement of parts and steps which are exemplified in the following detailed description. Reference to that description and to the accompanying drawings should be used for a fuller understanding and appreciation of the nature and objects of the invention, although other objects may be obvious to those skilled in the art.

The following present preferred formulations for use with respective plastic pipe types:

ABS Pipe Cement

ABS Resin	10-40%
Methyl Ethyl Ketone	90-60%

PVC Pipe Cement

PVC Resin	10-30%

Tetra Hydrofuran	0-50%
Diethoryethane	0-30%
Cyclohexanone	0-15%
Methyl Ethyl Ketone	30-60%
Acetone	0-10%

CPVC Pipe Cement

PVC Resin	2-10%
CPVC Resin	2-20%
Amorphous Silica	1-5%
Tetrahydrofuran	0-50%
Methyl Ethyl Ketone	10-40%
Acetone	0-5%
Diethoryethane	0-50%

(The preferred propellant for the above ~~formations~~ formulations is dimethyl ether ~~either~~ present in the range of from about 10% to about 40%

Brief Description of the Drawings

In accordance with the foregoing summary, the following presents a detailed description of embodiments of the invention presently considered to be the best mode.

For an entire understanding of the nature and objects of the invention, reference should be made to the following detailed description taken in connection with the accompanying drawings as follows:

Figure 1 is a perspective view of a trench wherein an installer is laying water pipe by joining pipe sections wherein provision is made to use the inventive SWC composition, method and system, in accordance with one embodiment of the present invention.

Figure 2 is an elevational perspective view of the novel aerosol SWC container disposed in the holster, in accordance with one embodiment of the present invention.

Figure 3 is a cross-section of an aerosol container in accordance with one embodiment of the present invention.

The drawings will be described further in connection with the following Detailed Description of the Invention.

Detailed Description of the Invention

In accordance with the foregoing summary, the following presents a detailed description of embodiments of the invention presently considered to be the best mode.

The preferred propellant for the above formations is dimethyl ether either present in the range of from about 10% to about 40%.

Referring to the Figures wherein like parts are designated with like reference numerals, shown in Figure 1 generally at 10 is a trench dug in the field, in which water pipe is to be laid. Trench 10 typically is dug into the ground some 7 to 10 feet below elevation and in length suitable for the terrain and length of pipe sections being joined. In Figure 1, installer 12 is joining pipe sections 14 and 16. It will be observed that section 16 adjacent bell end 20. Spigot 22 of pipe section 14 is adapted in circumference to fit inside bell 18 in dimensional tolerance such that the resulting seal is water tight after welding.

In order to ensure that spigot 22 will readily mate with bell 20, SWC is applied. Heretofore, as described above, installer 12 would employ liquid SWC on the pipe with a brush, rag, or the like, dispensed from an open container which must be held by the installer during application of the SWC, and then set some place thereafter. Often, this open container is set at the mouth or edge of trench 10 where it is in danger of being knocked over or contaminated.

Rather than painting the liquid SWC on the pipe with a brush, rag, or the like, the present invention relies on a system that includes an aerosol SWC and optional holster arrangement. Specifically, Figure 2 depicts aerosol container carried by holster 26. Holster 26 conveniently can be made from leather, nylon fabric or similar durable material and is adapted with clip 28 which enables holster 26 to be clipped onto belt 30 or onto the top of pants 32 of installer 12. As shown in Figure 1, installer 12 can withdraw container 24 from holster 26 for actuating valve 34, thus releasing aerosolized SWC from within container 24 to weld spigot 22 and/or bell 20. Once the SWC has been applied, installer 12 can readily replace container 24 into holster 26 and proceed with the water pipe installation.

Referring to container 24, housed therewithin is an aerosol SWC composition in accordance with the present invention, as described herein. Container 24 sprays from all angles, typically empties completely, and functions at temperatures below 20°F.

While a container fitted with a valve for dispensing pressurized contents from within container 24 has been described, it will be appreciated that any conventional system for dispensing pressurized material from within a container may be employed in accordance with the precepts of the present invention. A conventional aerosol can with valve has been used to illustrate the present invention as such units are ubiquitous commercial products that enable cost effective and efficient packaging and dispensing of the aerosol SWC system disclosed herein. Other equivalent dispensing systems may be conceived of by the skilled artisan and are included within the precepts of the present invention.

Figure 3 shows a cross-section elevational view of an aerosol can in accordance with one embodiment of the present invention. Figure 3 shows aerosol container 24 and actuating valve 34. Aerosol container 24 contains the aerosol SWC composition 36 under pressure that allows it to issue as a spray 38 from the actuating valve when activated. The actuating valve may have a standard or tapered orifice, although a wide open actuator is preferred.

Aerosol container 24 may also have a liner 40 on its interior surface.

While the foregoing description has been made with reference to water pipe, it will be appreciated that the present invention may be used with a variety of other pipe known in the art. For example, plastic residential and commercial plumbing and sewer pipe, drain pipe, process piping used in factories and other manufacturing facilities, and the like. Thus, the present invention should not be construed in a limiting sense with respect to the particular piping involved. So long as plastic pipe requiring attachment by welding action is at hand, the present invention has applicability with particular advantage in welding pipe, particularly in outdoor applications, where spillage and contamination are problematic.

The efficacy of the SWC of the present invention may be ascertained using ASTM method number D 740-94.

It is anticipated that certain changes may be made in the present invention without departing from the precepts herein involved. Accordingly, it is intended that all matter contained in the foregoing description shall be interpreted as illustrative and not in a limiting sense.